

English for Starters

Scientific Section

Twelfth Grade

Students' Book

Committee of Authors





حقوق التوزيع في الجمهورية العربية السورية
محفوظة للمؤسسة العامة للطباعة



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Great Scientists and Inventors p. 35



Introduction

People have probably been asking questions about the world around them since they first developed the power of speech many thousands of years ago, but it is only relatively recently that what we call 'science' has been widely practised. Indeed, the word 'scientist' was coined less than two hundred years ago. Previously, individuals whom we would call scientists were known in the English-speaking world as natural philosophers.

The origins of science are uncertain. From 3500 BCE the people of Sumer, a civilisation from the area that is now Iraq, began to record accurate and thorough measurements of the world around them. The ancient Egyptians developed the study of astronomy, mathematics, geometry and medicine. Later, in ancient Greece, Aristotle took some steps towards adopting the empirical method, which dictates that all theories must be tested against observations in the natural world.

India was also an early cradle of scientific thought. For example, Aryabhata (476–550 CE) worked out an accurate model of gravitation, based on the sun as centre of the solar system. China also has a proud and impressive history of scientific thought and discovery. Sometimes known as the 'four great inventions of China', gunpowder, papermaking, printing and the compass irrevocably changed warfare, communication and navigation.

However, scientific method was only perfected during what is known as the Islamic Golden Age (from approximately the 8^{th} to the 14^{th} centuries CE). Robert Briffault (1876 –1948 CE), a surgeon and an expert in human society, wrote the following in his book, The Making of Humanity (1928):

> What we call science arose as a result of new methods of experiment, observation and measurement which were introduced into Europe by the Arabs … Science is the most momentous contribution of Arab civilisation to the modern world …
> (p. 190)

One person in particular, Ibn al-Haytham (965 – 1039 CE), who conducted experiments on optics, is sometimes regarded as the 'father of science' as he pioneered modern scientific method. It is no accident that the English words 'algebra', 'chemistry' and 'physics' all derive from Arabic.

Over the succeeding generations, science has worked wonders, improving our lives in a great variety of ways. Transport, medicine and communication are just three examples. Of course, we must remember that scientific knowledge should be used with wisdom and care. Modern warfare and global pollution are two examples of the negative effects that can occur if science is handled badly.

Waste Disposal and Recycling



Every year, people throw away huge quantities of rubbish. In their daily activities, people generate many types of waste, including used paper, empty packages and food scraps. Homes, businesses and other places in the community all produce substantial quantities of waste. Three methods of disposing of solid waste are to bury it, to burn it or to recycle it.

Landfill

Until recently, people often disposed of waste in open holes in the ground, called open landfills. But these open dumps were dangerous. Rainfall dissolved some of the chemicals from the waste, forming a liquid called leachate. Leachate could pollute the soil, run off into streams and lakes, or trickle down into the groundwater.

Some countries have banned the use of open dumps. Another type of landfill is called a sanitary landfill, which is specially constructed to hold the waste material more safely.

A sanitary landfill holds municipal solid waste, construction debris and some types of agricultural and industrial waste. Once a sanitary landfill is full, it is covered with a clay cap to keep rainwater out.

Even well-designed landfills can pollute the soil and groundwater. And while capped landfills can be reused for some purposes, such as parks, they cannot be used for housing or agriculture.

Another solution is municipal solid waste composting. With this technique, all the solid waste that a community produces can be composted. This would dramatically reduce the volume of waste disposed of in sanitary landfills. One disadvantage of this type of composting is that heavy metals and toxic pesticide residues may be left in the compost.

Checkpoint

What are the three methods of burying waste called?

Incineration

The burning of solid waste is called incineration. This process has some advantages over landfills. Incinerators take up less space and do not pollute groundwater. The heat produced by burning solid waste can be used to generate electricity. Unfortunately, incinerators also have disadvantages. For example, they release some pollution into the air. And although incinerators reduce the volume of waste by as much as 90 percent, some waste still remains, and this has to be disposed of somewhere. Incinerators also cost much more money to build than landfills.

Recycling

The process of reclaiming raw materials and reusing them is called recycling. Recycling reduces the volume of solid waste. Recycling also saves the energy needed to obtain and process raw materials. Most recycling involves four main categories of product: metal, glass, paper and plastic.

Metal

Common metals such as iron and aluminium can be melted down and reused. The aluminium in soft drink cans, for example, can be recycled. Recycling metal saves money and causes less pollution than processing new metal. With recycling, no ore needs to be mined, transported to factories or processed. Recycling metals also helps to conserve these non-renewable resources.

Glass

Recycling glass is easy and inexpensive. Glass pieces can be melted down over and over again to make new glass containers. The recycled pieces melt at a lower temperature than the raw materials. Therefore less energy is required. Recycling glass also reduces the environmental damage caused by mining the raw materials that are used to make glass.

Paper

About 17 trees are needed to make one metric ton of paper. Paper mills turn wood into a thick liquid called pulp. Pulp is spread out and dried to produce paper. Pulp can also be made from used paper, such as old newspapers. Most paper products can only be recycled a few times. Recycled paper is not as smooth or as strong as paper made from wood pulp. Each time paper is recycled, the new paper is rougher, weaker and darker.

Plastic

When oil is refined to make petrol and other products, solid materials called resins are left over. Resins can be heated, stretched and moulded into plastic products. Common products made from plastic include milk jugs, detergent containers and soft drink bottles. When they are recycled, the new plastic can take on very different forms, such as carpeting, park benches, fibre filling for jackets, and many other things!

Is recycling worthwhile?

Recycling is not a complete answer to the solid waste problem. Some materials cannot be recycled. There are not enough uses for some recycled products, such as low-quality newspaper. Finally, all recycling processes require energy and create some pollution.

Reusing

Not all the materials we use have to be recycled. By reusing objects we can reduce the need for disposal sites and the polluting machinery used for some recycling processes. Empty glass bottles and jars can become flower vases, candle holders or storage vessels for rice, pulses and sugar. Plastic bags can be reused again and again and cardboard boxes can be used as floor coverings or for insulating your home.

Reduce~Reuse
Recycle~Respect

Comprehension Questions

1. What are the three methods of disposing of solid waste?
2. Why have some countries banned open landfills?
3. In what ways is a sanitary landfill better than an open landfill?
4. What are two disadvantages of sanitary landfills?
5. Give one advantage and one disadvantage of municipal solid waste composting.
6. What is an incinerator?
7. How can an incinerator make electricity?
8. Which is cheaper to build, an incinerator or a landfill?
9. Which metals are typically recycled?
10. Why is less energy required to recycle glass than to make new glass?
11. Draw a plan of a building that is entirely environmentally friendly. You should incorporate recycled and reused items in the building. Think of how you would make electricity for your building and how you would supply it with water, for example. Label each part, explaining what each part is and why you have chosen it for your building.
12. How is plastic made?
13. Write a brief paragraph proposing a recycling system for your school. Describe what material would be recycled / reused and what they would subsequently be used for.
14. Which materials are difficult to recycle? Why?
15. Is recycling a good idea? Why/Why not?



Further Information On

A Sanitary Landfill Site

Leachate treatment
The collected leachate is pumped into holding tanks and treated with chemicals.
Any leftover solids are collected and transported to a safe disposal site.

Gas recovery
Bacteria break down waste in a landfill, producing methane and carbon dioxide. These gases could build up pressure in the landfill and cause an explosion. To avoid that, vent pipes collect the gases and release them. The gases are sometimes burned off in a flare.

Solid waste layers
Compacting the waste reduces its volume and keeps the landfill from settling. Each layer of compacted waste is covered with a layer of clean soil or plastic.

Monitoring wells
Testing wells surround the landfill. The wells are monitored to detect any waste polluting the groundwater.

Leachate collection
Water moving through the landfill dissolves substances from the waste material, forming leachate, which collects at the bottom.

Liners
Layers of clay and plastic line the bottom and sides of the landfill. The liners keep liquids from leaking into the soil.

Questions

1. What is special about this landfill?
2. Why is it important to compact the waste before burying it?
3. What do you think happens when a town's landfill is full?
4. Make a list of everything you throw away over the next 24 hours, starting now. How much of your rubbish is packaging? How much of it is food scraps? How much of it can you reuse? How much of it can you recycle?
5. Design a rubbish bin with several compartments to encourage people to recycle materials. How many compartments will your rubbish bin have? What is each compartment for?
6. Copy and complete the table below. Then use the information as a basis for writing a short essay entitled 'Waste disposal and recycling'.

Method of waste disposal	Advantages	Disadvantages
Landfill		
Incineration		
Recycling		

Daily Life in Space

Great explorers have travelled across deserts, the Antarctic and up mountains, braving extreme conditions and facing great danger. Now, people even travel into space where the conditions are far more extreme and a tiny mistake can mean death within thirty seconds. They do not do it for fun or to place their country's flag on a planet; they are in space because they are highly qualified scientists who need to carry out very important work.

Checkpoint

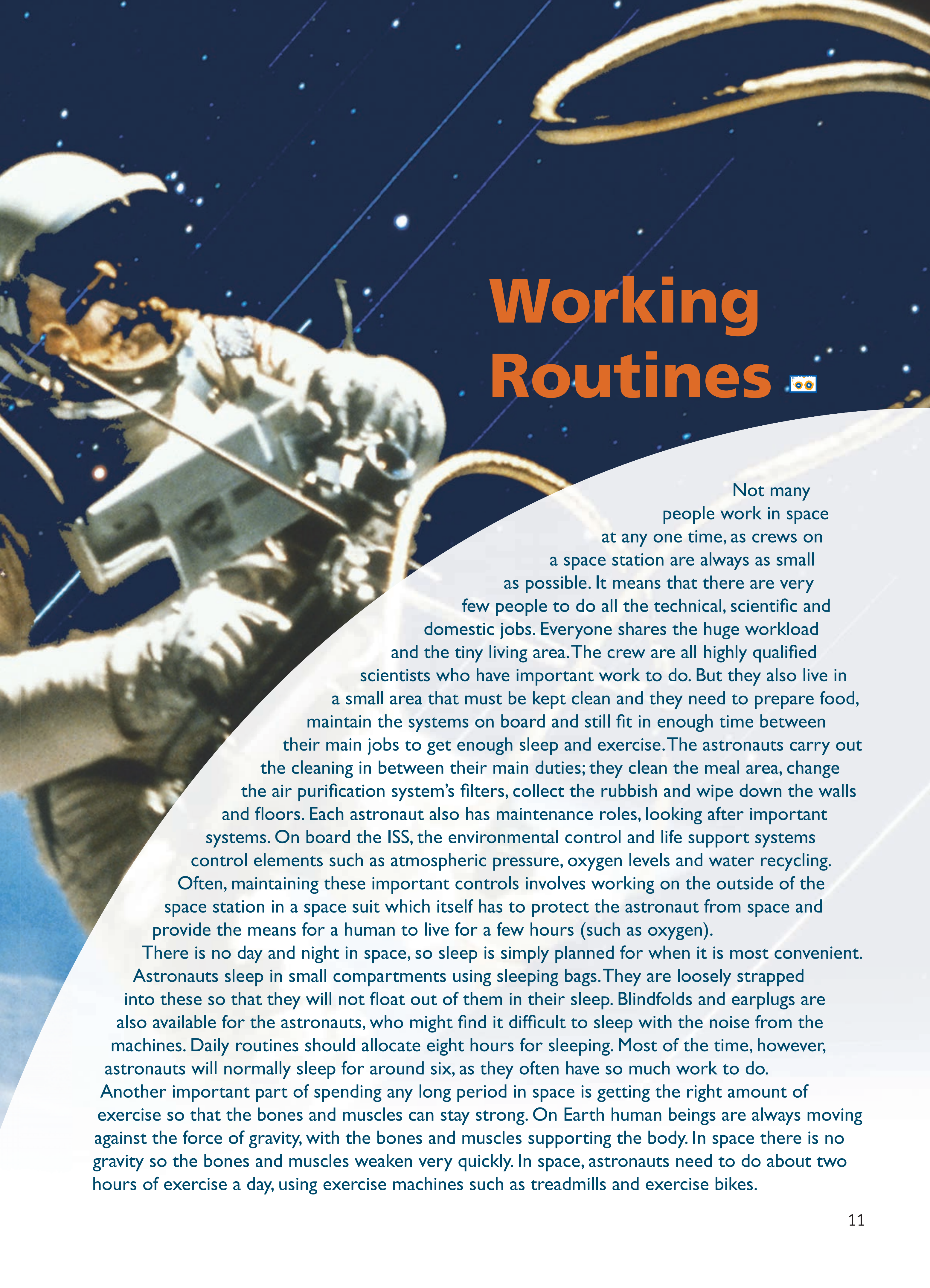
How do people eat and wash in space?

For a human being to go into space, survive and conduct important research, there needs to be careful organisation and planning. Daily life inside an airtight space shuttle or space station requires much more than just oxygen and heat. People require the correct atmosphere, a mechanism for removing the carbon dioxide that living things produce, and a reliable means of day-to-day living in microgravity (ways of eating, drinking and washing, for example).

For humans to survive in space for months at a time, all these things need to be very carefully planned. If, for example, the carbon dioxide extractor doesn't work, or the system for maintaining the correct atmosphere breaks down, then they will die.

All the correct materials, food, oxygen cylinders and fuels have to be prepared and supplied correctly. All the machinery and seals that keep the air in, the cabin pressure correct and that protect the astronauts from the freezing cold vacuum of space have to work perfectly every second of every minute. The machinery is complex, yet it must not break down once; all the supplies are important, yet spares cannot be carried because of limited space. A small miscalculation in the planning and preparation of the space mission will probably mean the death of everyone on board.

Despite this, people can survive very successfully in space for months at a time. They can live in relative comfort, and they can carry out important work that could not be done anywhere on Earth. Any space mission involves enormous risks, but with a highly trained, skilled and hard-working team, people can be prepared for and can conduct space missions of great scientific importance. The International Space Station (ISS) contains laboratories where scientific experiments are carried out that cannot be done on Earth because of its atmosphere and heavy gravity.



Working Routines

Not many people work in space at any one time, as crews on a space station are always as small as possible. It means that there are very few people to do all the technical, scientific and domestic jobs. Everyone shares the huge workload and the tiny living area. The crew are all highly qualified scientists who have important work to do. But they also live in a small area that must be kept clean and they need to prepare food, maintain the systems on board and still fit in enough time between their main jobs to get enough sleep and exercise. The astronauts carry out the cleaning in between their main duties; they clean the meal area, change the air purification system's filters, collect the rubbish and wipe down the walls and floors. Each astronaut also has maintenance roles, looking after important systems. On board the ISS, the environmental control and life support systems control elements such as atmospheric pressure, oxygen levels and water recycling. Often, maintaining these important controls involves working on the outside of the space station in a space suit which itself has to protect the astronaut from space and provide the means for a human to live for a few hours (such as oxygen).

There is no day and night in space, so sleep is simply planned for when it is most convenient. Astronauts sleep in small compartments using sleeping bags. They are loosely strapped into these so that they will not float out of them in their sleep. Blindfolds and earplugs are also available for the astronauts, who might find it difficult to sleep with the noise from the machines. Daily routines should allocate eight hours for sleeping. Most of the time, however, astronauts will normally sleep for around six, as they often have so much work to do.

Another important part of spending any long period in space is getting the right amount of exercise so that the bones and muscles can stay strong. On Earth human beings are always moving against the force of gravity, with the bones and muscles supporting the body. In space there is no gravity so the bones and muscles weaken very quickly. In space, astronauts need to do about two hours of exercise a day, using exercise machines such as treadmills and exercise bikes.

Food

At the start of the 1960s, when Yuri Gagarin first went into space, the food was bite-sized and kept in small aluminium tubes. Food was designed this way so that it wouldn't take up too much room and could be eaten in a single mouthful before it floated away. Now, however, astronauts enjoy food from plastic containers that just need to have hot or cold water added. Fruit and nuts can also be eaten in space. When drinking liquids, a straw is used to suck the liquid out of a sealed package. It mustn't spill or float out of the cup, or it could damage some of the computers.
Another, equally important, issue to address is the toilet. In space this is largely similar to one on Earth, with the difference being that astronauts have to strap themselves onto it. In place of running water to flush it, there is a vacuum-cleaner-like system to suck up the waste, which is then dried and disposed of on Earth.

Health

People need to keep clean in space to stay healthy and avoid spreading germs. They do this by washing themselves with ethanol cloths or wet towels, and they use special shampoo that does not need water or produce foam.
Each astronaut in the crew has a specific assigned role and receives intensive training for it. The crew medical officer is in charge of the sick and is trained in first aid and in stitching up wounds and giving injections. The medical kit on board will treat minor injuries and illnesses in space and can be used to stabilise the patient's condition during the flight back to Earth. All the crew are trained in emergency resuscitation after a heart attack.

Comprehension Questions

1. Give three examples of features needed on a space station to ensure that people can survive.
2. Write a short paragraph explaining your opinion of space travel. Is it important, or should the money needed for space exploration be spent on Earth's problems?
3. How reliable do the systems for maintaining life need to be?
4. What are 'spares'? Why are they not available in space?
5. How can the dangers of a typical space mission be reduced?
6. The research done in space could not be carried out on Earth. Why is this?
7. Who helps the astronauts with cleaning the space station?
8. What three main types of job does every astronaut have to do?
9. What system or systems often need to be worked on from outside the space station?
10. How long do astronauts have to strap themselves into their sleeping bags for?
11. Why is it important to stay fit in space?
12. Who was Yuri Gagarin? Do some personal research and write a brief biography of him.
13. Imagine you are an astronaut about to have a weekly meeting about the status of the ISS. Write an agenda for the meeting including reports on all the areas of the ship such as cleaning, maintenance and the health of the crew.
14. How many members of each crew are thoroughly trained in first aid?
15. How serious are the medical emergencies that can be treated in space?

Further Information On

Scientific Research in Space

One of the main goals of the ISS is to provide a place to conduct experiments that require one or more of the conditions found in space (such as microgravity). So far, most research has only been on the effects of microgravity on humans.

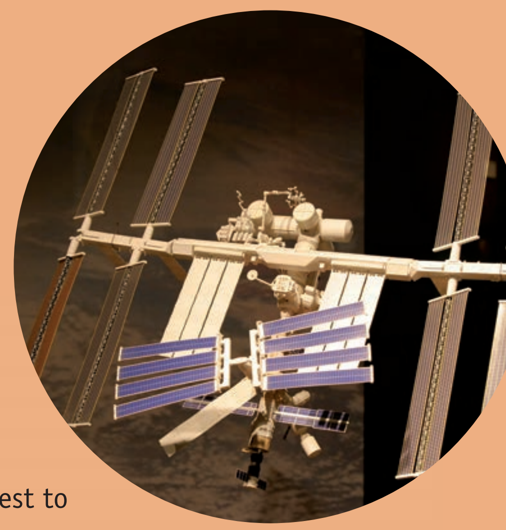
Astronauts study how long periods in space affect the body by working on subjects like bone loss and fluid shifts. The effect of near weightlessness on evolution, development and growth, and the internal processes of plants and animals, are now also the subject of research.

The physics of fluids in microgravity is not completely understood. In space, unlike on Earth, fluids can be mixed or combined almost regardless of their relative weights. Researchers also want to study the combination of fluids that would not mix well on Earth. By examining reactions that are slowed down by low gravity and low temperatures, scientists also hope to gain new insights into the way matter is made up.

Researchers also hope to examine combustion in an enviroment with less gravity than on Earth. Any information they can find involving the efficiency of the actual burning, or the creation of by-products, could improve the process of energy production, which would be of economic and environmental interest.

Questions

1. Name an important aim of the International Space Station.
2. Name two effects that living in microgravity can have on the body.
3. Besides the effects of microgravity on humans, such as bone loss and fluid shifts, what else is being studied in space?
4. Create your own experiment for scientific research in space. Take something you like – your favourite food or activity, for example – and invent an experiment you could conduct on it in space. Write a brief report imagining the outcomes.
5. What do scientists hope that the study of the physics of fluids in space will help?
6. Why would examining combustion in space be of interest to people on Earth?



The IT Age

What happens when you go shopping and you've forgotten your money? A German department store has the answer. Instead of paying with notes and coins, customers can now pay with their fingerprints! A scanner records the contours of your fingertip and sends the image electronically to your bank, which removes the money from your account. Welcome to the IT Age!

What is IT?

The modern world is defined by IT, or Information Technology. The term 'Information Technology' emerged in the 1970s, but it can in fact be traced back to World War II, when the military and early computer specialists worked together to develop electronics, computers and information theory. Information Technology has a broad remit encompassing the design, development, implementation and management of computer-based information systems; particularly software applications and computer hardware. In short, IT deals with the use of computers and computer software to convert, store, process, transmit and retrieve information securely. IT comprises various disciplines: Data Management, Computer Networking, Software and Computer Engineering are all crucial components. In recent years, the field has ballooned through advances in computer applications and the Internet, to include mobile telephones, computer games and video technology as well as new ways of sharing, processing and storing information electronically. The abbreviation ICT – Information and Communication Technology – which refers explicitly to electronic communication, is thus an increasingly familiar term. In a matter of decades, computers have developed from large, bulky machines to highly sophisticated devices that fit in the palm of your hand. Computers are evolving as rapidly as the ways in which people use them; one electronics company is developing a refrigerator that, when it is empty, emails a shopping list to the nearest supermarket!

Data Management

The management of data is crucial to the IT industry and refers to the analysis, organisation and storage of information within a computer, or among a group of electronic devices.

Software

The programs that control what a computer is able to do are known as software. Applications such as word processors, spreadsheets, media and graphics programs, and personal information management are all examples of computer software.

Computer Networking

A computer network is a set of computers or devices connected to each other. A Local Area Network (LAN) serves a relatively small environment, a university for example, while a Wide Area Network (WAN) spans a larger area; multinational companies use WANs to connect their offices in different countries. A wireless network is different because it transfers data over sets of radio transceivers, instead of through cables.

Checkpoint

What is a computer virus?

Computer Engineering

Computer engineering combines elements of electrical engineering and computer science. Computer engineers are involved in many aspects of computing, from the design of personal computers to monitoring the many subsystems in motor vehicles.

The Millennium Bug

One of the most significant moments in IT history occured at the close of the twentieth century when experts predicted that computer systems would malfunction at midnight on 31 December 1999. Computer scientists speculated that IT programmes would stop working or produce incorrect results because they stored years with two digits instead of four – 98 instead of 1998, for example. They believed that the year 2000 would be represented by 00, and would be interpreted by software as the year 1900. This became known as the Millennium Bug, or the Year 2000 Problem. They predicted that IT systems, ranging from meteorological devices and hospital equipment to data storage systems in governments, banks and airports, would fail. It was thought that embedded systems that also made use of date logic, such as utilities and other crucial infrastructure, would collapse too. When midnight arrived, the Millennium Bug caused only minimal damage; some Australian bus-ticket machines failed to work and a few British banking transactions were temporarily disrupted. Many still debate whether the Millennium Bug's limited effect was thanks to substantial government expenditure or whether its predicted threat was over-stated by the media.

Comprehension Questions

1. When did the term Information Technology emerge?
2. Which two branches of society joined forces to develop IT?
3. Find five verbs in the text that show what computers can do with information.
4. Take an object that you use every day; a chair, a book or a piece of clothing, for example; and write a paragraph and draw a diagram to explain how you would transform it through the use of IT.
5. Write the following abbreviations in full, with a brief explanation of the meaning of each:
   a) LAN b) ICT c) WAN
6. Why are pieces of software important to the way a computer works?
7. Computer engineering combines two disciplines. What are they?
8. Explain what the Year 2000 Problem refers to, and state what it is more commonly known as.
9. Create a table with two columns. In one, list the damage it was predicted the Year 2000 Problem would cause. Write what actually happened in the other. Then explain why one column contains more information than the other.



The Future of the Internet

Over one hundred million websites, made up of billions of web pages, now exist. The Internet has transformed the way people communicate with each other and access information, and continues to evolve every day. Recent scholarship suggests that by 2020, the Internet will be a thriving, low-cost network of billions of devices, accessible to anyone, anywhere.

Some Internet professionals also predict that it will provide a reality parallel to our own. Virtual Reality will allow people to live, work and interact with others in an electronic world, driven by the Internet. Some fear, however, that Virtual Reality will encourage people to opt out of human society, creating a world of two halves, with those in Virtual Reality losing touch with the realities of the real world.

Today, designers and inventors are using the Internet in increasingly innovative ways. Two students at Keio University in Japan have recently produced the Internet Umbrella. The umbrella's handle contains a projector that displays images from the Internet onto the underside of the umbrella's canopy. The umbrella is also fitted with a Global Positioning System that allows carriers to find their way, wherever they are, while looking at a three-dimensional map projected into the umbrella above them.

Even large companies, when developing their products, use the Internet to interact with their customers. A prominent sports-shoe manufacturer is inviting the public to design trainers online. The design is then sent electronically to a factory, where it is made to the customer's specifications. It is certain that the Internet, and Information Technology in general, will continue to transform the world we live in, in ways we have yet to imagine.

Questions

1. What is Virtual Reality?
2. Describe how the Internet Umbrella can help you if you are lost.
3. How will a sports manufacturer's use of the Internet benefit a) the customer b) the manufacturer?
4. What effect do experts predict Virtual Reality will have on human society? Write a paragraph giving your opinion on the state of society if this prediction comes true.
5. Design a web page for a product or a service that uses IT. Read about the Internet Umbrella again to help you.

Alfred Nobel

How many times in your life have you read the word 'Nobel'? How many times have you asked yourself what it means?

Alfred Bernhard Nobel (1833-1896) was a Swedish chemist, engineer, innovator, armaments manufacturer and the inventor of dynamite.

Nobel was born on 21 October, 1833, in Stockholm, Sweden. He was educated in Russia, France and the United States. He was fluent in five languages and had a great interest in literature. Nobel was also very interested in social and peace-related issues, and held views that were considered radical for his time. Nobel travelled widely, then returned to work in his father's factory in St Petersburg, Russia.

Later, in Sweden, Nobel began to experiment with explosions. In 1867, he received a patent for dynamite. About 1875 he produced an even more powerful explosive called blasting gelatin. In all, Nobel held more than 100 patents.

Nobel's Last Will

Nobel died in 1896 and was buried in Norra Begravningsplatsen in Stockholm.

The incorrect publication in 1888 of a premature obituary of Nobel by a French newspaper, condemning him for his invention of dynamite, is said to have brought about his decision to leave a better legacy after his death.

On November 27, 1895, Alfred Nobel made his last will in Paris. When it was opened and read after his death, the will caused a lot of controversy both in Sweden and internationally, as Nobel had left much of his wealth for the establishment of a prize! His family opposed the establishment of the Nobel Prize, and the people he asked to award the prize refused to do what he had requested in his will. Thus, it was five years before the first Nobel Prize could be awarded in 1901.

Checkpoint

Who was the first African woman to win the Nobel Peace Prize; and why was she awarded it?

How many different subjects are Nobel prizes awarded for?

The Nobel Prize

Since 1901, the Nobel Prize has been honouring men and women from all corners of the globe for outstanding achievements in Physics, Chemistry, Physiology or Medicine, Literature and Peace.

Who selects the Nobel Laureates? In his last will and testament, Alfred Nobel specifically designated the institutions responsible for the prizes he wished to be established: The Royal Swedish Academy of Sciences for the Nobel Prize in Physics and Chemistry, the Karolinska Institute for the Nobel Prize in Physiology or Medicine, the Swedish Academy for the Nobel Prize in Literature, and a committee of five persons to be elected by the Norwegian Parliament (Storting) for the Nobel Peace Prize. In 1968, the Sveriges Riksbank established the Sveriges Riksbank Prize in Economics in memory of Alfred Nobel. The Royal Swedish Academy of Sciences was given the task of selecting the Economics Prize Laureates starting in 1969.

Presentation ceremonies are held on December 10, the anniversary of Nobel's death. The Nobel Foundation in Stockholm supervises the awarding of the prizes. The peace prize is awarded in Oslo, Norway. The other prizes are presented in Stockholm. Each Nobel Prize winner receives a gold medal, a diploma and prize money.

In 1901, the following prizes were awarded:

Physiology or Medicine: Emil von Behring (Germany) for his work on serum therapy.
Literature: René Sully Prudhomme (France) for poetry.
Peace: Jean Henri Dunant (Switzerland), founder of the Red Cross, and Frédéric Passy (France), founder and president of the first French Peace Society.
Physics: Wilhelm C. Roentgen (Germany) for the discovery of X rays (also called roentgen rays).
Chemistry: Jacobus Henricus van't Hoff (the Netherlands) for the discovery of the laws of chemical dynamics and osmotic pressure.

Nomination for the Nobel Prizes

Each year the respective Nobel Committees send individual invitations to thousands of members of academies, university professors, scientists from numerous countries, previous Nobel Laureates, members of parliamentary assemblies and others, asking them to submit the names of candidates for the Nobel Prizes for the coming year. These nominators are chosen in such a way that as many countries and universities as possible are represented each year. The Nobel Prize has been given to several people from the Arab World, including: Mohamed El Baradei (Egyptian, Peace, 2005), Ahmed H. Zewail (Egyptian and American, Chemistry, 1999) and Naguib Mahfouz (Egyptian, Literature, 1988). And several prominent figures from the Arab world have been nominated for Nobel Prizes. The Syrian philosopher Michel Allawerdi was nominated for the Peace Prize in 1951, for his use of music in spreading peace across the world. The identity of Nobel nominees are kept secret for fifty years after their nomination.

Comprehension Questions

1. What was Alfred Nobel's profession?
2. What is an innovator?
3. How many languages did Alfred Nobel speak?
4. What is a patent?
5. When did Nobel receive a patent for dynamite?
6. Where did Nobel first test dynamite?
7. What did Nobel patent in 1875.
8. How many patents did Nobel have?
9. After Nobel's death, why was there a delay of five years before the first Nobel prizes were awarded?
10. Why are the prizes awarded on December 10 each year?
11. Write a nomination proposal for someone you think deserves any of the Nobel Prizes. Give details of their achievements and clear reasons to support your nomination.



The Nobel Prize and Naguib Mahfouz

1911: Born in the old Gemaliya quarter of Cairo on 11 December, Mahfouz was the youngest of seven siblings. His father was a civil servant. Cairo's busy narrow streets became the inspiration for his work.

1934: Graduates from Cairo University with a degree in philosophy.

1936: Abandons an MA in philosophy to become a full-time writer. Starts working as a civil servant to fund his writing.

1939: His first novel, *The Curse of the Ra*, is published.

1956-7: The three volumes of the *Cairo Trilogy* are published.

1971: Retires from the Egyptian Civil Service.

1988: Awarded the Nobel Prize for Literature.

1989: Joins a group of writers and intellectuals supporting the rights of authors in Arab countries.

2005: His final book, *The Seventh Heaven,* is published.

2006: Becomes increasingly unwell and almost completely blind. Dies at the age of 94. Upon his death he is the third oldest living Nobel Laureate and the only Arabic-language writer to have won the Nobel Prize.

Naguib Mahfouz was an Egyptian novelist who became one of the most famous writers in the Arab world when he won the Nobel Prize for Literature in 1988. The award raised the profile of Arabic literature and Mahfouz's books were subsequently translated into many languages.

Mahfouz wrote thirty novels, over one hundred short stories, dozens of film scripts and more than two hundred articles. His first novels explored Egyptian history and were intended to be part of a monumental cycle of thirty books, charting the entire history of Egypt. The project was never completed but Mahfouz often dealt with history, society and politics in his work.

Mahfouz was an experimental writer and is credited with modernising Arabic literature. His epic Cairo Trilogy, which most critics consider to be his masterpiece, is a huge work of around 1,500 pages. Each volume is named after a street in Cairo: *Palace Walk* (1956), *Palace of Desire* (1957) and *Sugar Street* (1957). The trilogy charts the life of three generations of the Abd al-Jawad family, spanning the period from 1917 to the end of the Second World War. The books are remarkable because in them Mahfouz handles a huge cast of well-drawn characters with great skill and masters the Arabic novel form, which had only come into being a few years previously.

Questions

1. Make a list of events that fall between 1917 and 1944 – the time span of the *Cairo Trilogy*. Which do you think Mahfouz incorporated into the trilogy and why?
2. Mahfouz wrote over 100 short stories during his life. Work in pairs and discuss what a short story is. Then discuss the area where you live, in as much detail as possible. Write a short story – about a page long – using these ideas and focusing on every aspect of the characters involved and the surroundings they live and work in.

What is Caffeine?

Caffeine

Chemically speaking, caffeine was first extracted from plants in its pure form in 1820. But now, it can be made in the laboratory. Caffeine is an odourless, slightly bitter solid. Caffeine dissolves in water and alcohol and its crystals look like needles. When caffeine is removed from the source plant and reduced to its purest state, it forms a white powder. This powdered form of caffeine is very bitter, which is why many drinks containing caffeine also contain lots of sugar or other sweeteners.

Caffeine is used as a stimulant of the heart and nervous system in certain disorders and is found in a number of non-prescription pain-killing preparations. Caffeine may not be addictive in the classic sense, but the body does build up a tolerance over time. Some people find it difficult to function without at least one cup of strong coffee or tea in the morning. The stimulating effects of caffeine are caused by a central nervous reaction. The heart rate increases, blood vessels expand and the brain receives more oxygen. This effect can last up to an hour.

I have loads of homework to do and plenty of tests to prepare for, and I don't have time to finish all my work. I say to myself, I have to stay awake to finish my studies. I go to the kitchen and make a cup of coffee. It is the caffeine in the coffee that helps me stay awake. What is the reason for this?

What are the Natural Sources of Caffeine?

Caffeine is a stimulant found in many plant species. The most common natural sources of caffeine are coffee, tea and cocoa, although cocoa contains a comparatively low amount.

Coffee (which varies according to brand and method of preparation) is, without a doubt, one of the most popular natural sources of caffeine. A 170g cup of instant coffee contains about 60mg of caffeine.

Tea also contains varying amounts of caffeine. Green tea has the lowest, with only 35mg per 170g cup; black tea has up to 75mg, depending on the brand and country of origin.

Cocoa is one of the healthiest natural sources of caffeine. 28g of baking chocolate contains about 25mg of caffeine, but a glass of chocolate milk barely reaches 5mg.

The chemical formula of caffeine is

$C_8H_{10}N_4O_2$

What are the Health Effects of Caffeine?

There is much debate about the health effects of caffeine, and whether these effects are primarily positive or negative. Caffeine, particularly in coffee, has been studied closely to determine where it may be of benefit, and where it may cause undesirable effects.

Caffeine is a stimulant. In healthy adults this means that the effects of caffeine will tend to make one feel more alert and less sleepy, and will temporarily boost metabolism. Yet because it is a stimulant, one of the effects of caffeine is a let-down a few hours after intake. If a person drinks coffee or other caffeinated beverages all day, they are unlikely to feel this drop in mood or alertness. The person who drinks caffeinated beverages in the morning only, however, may find themselves feeling more tired as the day progresses.

When taken in small amounts, caffeine increases the circulation and is considered harmless for most people. When taken in large amounts, however, it causes nervousness and loss of sleep. The use of caffeine may also cause rapid heart rate, increase in urination, headaches and digestive disturbances. A lethal dose of caffeine is about 10g.

Because caffeine is a mild diuretic, the effects of caffeine upon those who do not have sufficient fluid intake may include mild dehydration. If one regularly indulges in caffeinated beverages, fluid intake of water or juices should be increased. Doctors urge people especially to monitor caffeine intake during very hot weather, or when travelling to hot climates. The effects of caffeine in such conditions are likely to be more harmful than beneficial.

Test yourself
Are you addicted to caffeine?

1. How many cups of coffee do you drink daily?
   a) 3 cups
   b) 2 cups
   c) 1 cup
2. You should drink a cup of coffee:
   a) every day in the morning.
   b) every day in the afternoon.
   c) less than once a day.
3. I fight headaches by:
   a) drinking coffee.
   b) sleeping.
   c) taking medicine.
4. If I go to the supermarket, I prefer
   a) to buy caffeinated coffee.
   d) to buy decaffeinated coffee.
   c) not to buy coffee at all.



Mostly a. Sorry to tell you, but you're probably addicted to caffeine. If you feel like you can't function in the morning without your caffeine fix, you should probably cut down a little bit.

Mostly b. So long as you keep going at the rate you're going, you probably aren't going to get addicted. Be careful though that your habit doesn't become too serious.

Mostly c. You're not addicted at all. You probably don't even drink much caffeine – in coffee at least.

Checkpoint

Is there any caffeine in decaffeinated coffee?

Comprehension Questions

1. Describe the appearance, taste and smell of pure caffeine.
2. Why do many drinks that contain caffeine also contain lots of sugar and sweeteners?
3. Is caffeine addictive?
4. What are the most common natural sources of caffeine?
5. How much caffeine is there in a 170g cup of tea?
6. How much caffeine will kill a person?
7. Write two paragraphs about the positive and negative effects of caffeine on the human body.
8. Create a timeline that charts a quantity of caffeine from its initial creation to its inclusion in coffee and soft drinks. Give a brief but detailed description of each stage of the process.



Caf or Decaf or Half Caf Coffee

When you go to a coffee shop, you look at the menu. The first thing that appears on the list is the following: Caf or Decaf or Half Caf Coffee. You may get confused.

'Caf' means 'Caffeine': the coffee contains the full quantity of caffeine.

'Decaf' means 'Decaffeinated': the coffee contains 3% caffeine.

'Half Caf' means 'Half Caffeinated': the coffee is a mixture of 50% caffeinated and 50% decaffeinated.

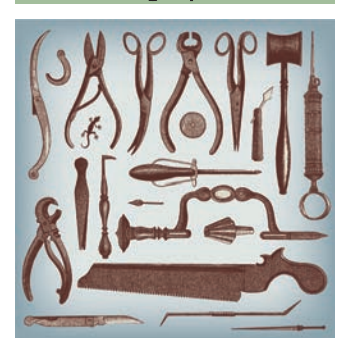
Many people who like caffeinated coffee drink Half Caf because it reduces their caffeine intake while still packing a punch. It also allows people to drink twice as many cups of coffee, compared to those who drink Caf.

Half Caf is a nice compromise for those who prefer the taste of caffeinated coffee but are sensitive to caffeine. In most methods of decaffeination, flavour molecules are separated from the beans along with caffeine molecules. An agent is used to bind the caffeine in order to remove it, and then the flavour molecules are returned to the beans through soaking. One method uses baths already saturated with flavour molecules to help preserve the flavour of the beans. How the beans are decaffeinated can have a significant effect on the coffee's taste.

Questions

1. What are the advantages and disadvantages of Half Caf Coffee?
2. Describe two different ways in which coffee can be decaffeinated.
3. Conduct a survey of your family, friends or neighbours. Interview about ten people and find out how many cups of coffee each person drinks per day. Also ask which kind of coffee they drink. Make a graph or table to show your results. Write a report and present your findings to your class.

Modern Medicine


old surgery tools

Surgery

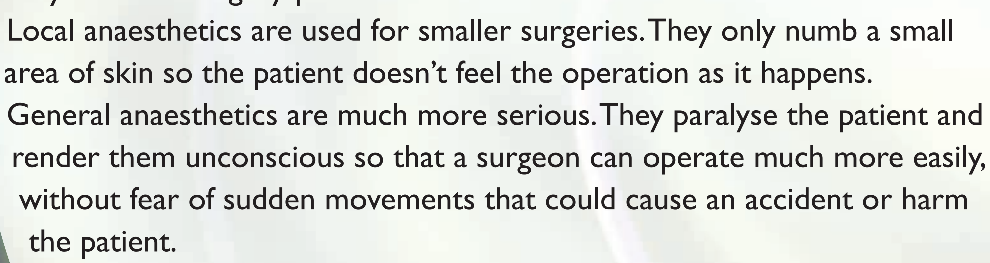
Unless you are very lucky, you will probably have to undergo surgery at some point in your life. Surgery is used to solve problems that cannot be treated with conventional medicines. Surgery has been practised since ancient times. It requires a doctor to make an incision into the patient's flesh to repair or remove something within the body. In the modern era, surgery has become far safer and more commonplace than in the past, and it is now employed to cure a wide range of ailments.


surgeons

How does surgery work?

The surgical process is very complex and a lot of care and patience is required before a surgical operation can begin. It is essential that every item in the operating theatre remain clean and uncontaminated. Clean, sterile items that are free of germs are kept separate from contaminated items at all times. All surgical equipment is sterile and, if it comes into contact with any unclean surface, it must be removed or re-sterilised immediately.

Besides the surgeon, the most important member of the surgical team is the anaesthetist. It is this person's job to administer the drugs that allow the patient to undergo surgery at all. Because surgery would be incredibly painful if a patient could feel what was happening, anaesthetics are the only way to make surgery possible.



Local anaesthetics are used for smaller surgeries. They only numb a small area of skin so the patient doesn't feel the operation as it happens. General anaesthetics are much more serious. They paralyse the patient and render them unconscious so that a surgeon can operate much more easily, without fear of sudden movements that could cause an accident or harm the patient.


anaesthetist

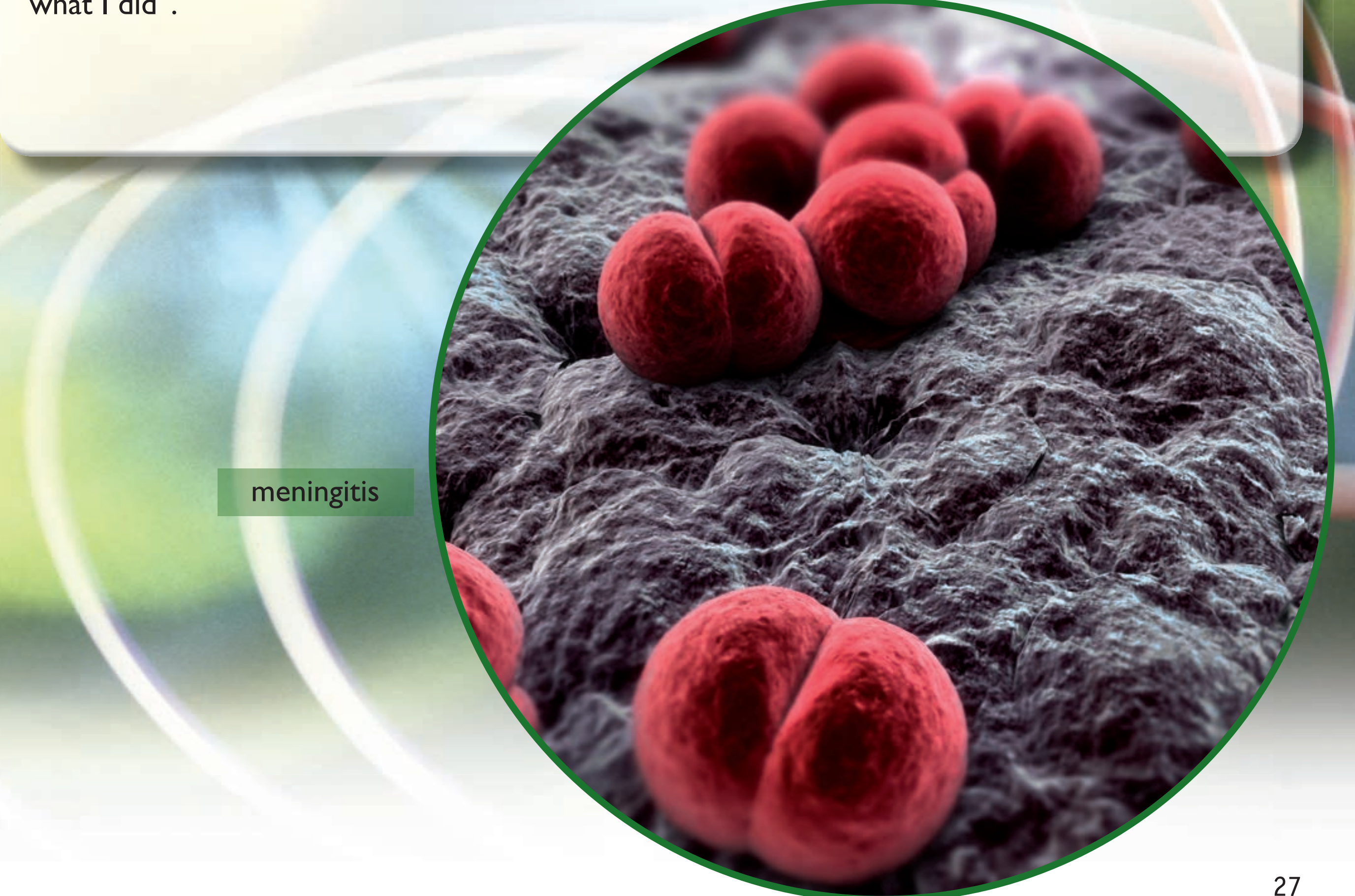
Antibiotics

Bacteria are tiny cells that live everywhere on Earth, including in our bodies. They are responsible for spreading many types of diseases through infection. If the wrong types of bacteria are allowed to grow in our bodies, they can cause respiratory failure, digestive problems or dangerous skin diseases like gangrene. Fortunately, in the modern world, numerous antibiotics have been developed that can protect us from, or even destroy, these dangerous types of bacteria.

The first antibiotic to be discovered was penicillin and it remains one of the most useful and important antibiotics in use today. A Scottish scientist called Alexander Fleming, who noticed it by accident, first discovered penicillin. While researching a certain type of dangerous bacteria, Fleming, who was notoriously untidy, left some samples of bacteria on a bench in the corner of his laboratory for a month while he went on holiday with his family. When Fleming returned he noticed that mould had grown on one of his samples and that this mould had destroyed all the bacteria it touched. Fleming was very excited by this discovery and he soon began to test the mould on other types of disease causing bacteria. He learned that the mould had an effect on many different types of bacteria; it could combat the bacteria that caused scarlet fever, pneumonia, meningitis and diphtheria, and that it was able to cure these diseases.

At first, the mould, which Fleming named penicillin, worked slowly and Fleming was unable to find a chemist skilled enough to manufacture it in any great amount. It was only ten years later, when a team of researchers at Oxford University, led by Howard Florey, began to test the medical uses of penicillin, that it began to be made in large quantities. It is still one of the most effective and commonly used drugs in use today.

Many years after his discovery, Fleming would remark "I certainly didn't plan to revolutionise all medicine by discovering the world's first antibiotic, or bacteria killer. But I suppose that's exactly what I did".



meningitis

Comprehension Questions

1. What does a doctor have to do to perform surgery?
2. Think of another word meaning “clean” and “uncontaminated”.
3. Who is the next most important member of the surgical team after the surgeon?
4. Explain the difference between general and local anaesthetics.
5. What is bacteria?
6. What do we use to protect ourselves from bacteria?
7. What was the first antibiotic to be discovered?
8. Who discovered it?
9. How did he first notice it?
10. What diseases can penicillin cure?
11. Who tested and developed the medical uses of penicillin?
12. What did Fleming later say about his discovery?



bacteria

Antibiotic Resistance



Antibiotics are incredibly useful and they have transformed modern medicine. However, there is a danger that we use them too much. The more we use antibiotics, the more the bacteria they fight get used to them and build up a resistance.

There are many reasons why this might happen. Often patients stop taking a course of antibiotics when they start to feel better but before all the bacteria have been eliminated. This means that the bacteria that survive are the strongest and most resistant. These resistant bacteria will multiply and spread and, in future, will not be eliminated by the same antibiotics. There is a real danger that these new "superbugs" could cause diseases that antibiotics are unable to fight.

It is very important not to overuse antibiotics in order to prevent bacteria from becoming too resistant. Try to avoid antibiotics unless strictly necessary and, if you are taking them, make sure you take everything prescribed and don't just stop when you feel better. You should always wash your hands, especially when you feel ill, to make sure you kill all of the resistant bacteria.



antibiotics

Questions

1. Why is it dangerous to use antibiotics too much?
2. Why is it important to complete a course of antibiotics?
3. What is a name for a very resistant type of bacteria?
4. Think of some more ways that you can prevent the spread of bacteria.
5. Write a paragraph to persuade people to be more careful about using antibiotics.

Glossary

A

absorbent: a substance or item that soaks up liquid easily

addicted: needing to take or do something in order to feel normal

airtight: not allowing air to escape or pass through

aluminium: a light silver-grey metal

anaesthetic: a drug that stops you feeling pain

antibiotic: a drug used to kill bacteria and cure infections

armament: military weapons and equipment

atmosphere: the mixture of gases surrounding the Earth

B

bacteria: small living things, some of which cause illness or disease

beverage: any type of drink

blindfold: a cloth that covers someone's eyes to prevent them from seeing

blood vessels: a structure of tubes that carry blood through the tissues and organs

brand: a product from a particular company

by-product: a side effect

C

carbon dioxide: a gas, produced when animals breathe out or when carbon is burnt in the air

carpet: a thick layer of fabric used to cover the floor

cell: the smallest part of a living thing that can exist by itself

circulation: the continuous motion by which the blood travels through all parts of the body under the action of the heart

clay: a type of heavy, sticky earth used to make pots, bricks, etc.

coin: invent a new word or phrase

combustion: the process of burning something

compact: closely and neatly packed together; dense

compartment: a separate section or part of something, such as in a refrigerator

compost: decayed organic material used as a plant fertiliser

compromise: an agreement that comes from each side accepting less than what they want

conserve: prevent from being overused

contaminate: to make a substance dirty or harmful by putting an unclean or dangerous substance in it

contour: outline of a shape

conventional: what is normally done or believed

cylinders: a shape or container with circular ends and long straight sides

D

debate: serious discussion involving lots of people

dehydrate: to lose a large amount of water from the body

detergent: a liquid or powder used for washing clothes, plates, etc.

diabetes: a serious disease in which there is too much sugar in your blood

diction: the choice and use of words and phrases in speech or writing

digest: break down food in the stomach and intestines into substances that can be used by the body

discard: get rid of someone or something that is no longer useful or desirable

disposal: the action or process of throwing away or getting rid of something

diuretic: a drug that causes an increased passing of urine

E

ecstasy: an overwhelming feeling of great happiness or joyful excitement

eligible: to be able to or to be allowed to do something

eliminate: remove completely

embed: to fix an object firmly and deeply in a surrounding mass

evolution: the scientific idea that plants and animals develop and change gradually over a long period of time

expenditure: the total amount of money an organisation or person spends during a particular amount of time

F

fibre filling: a material made from many small threads, often used to fill or insulate

fluctuate: to rise and fall irregularly in number or amount

fluid: a liquid

G

gelatin: a clear substance used in food preparation, photographic processes and glue

gravity: the force that attracts a body toward the centre of the Earth

H

hormone: a chemical substance produced by your body that influences your growth and condition

I

implementation: the action of putting a decision, plan or agreement into effect

incineration: to destroy something by burning, such as waste

incision: a surgical cut made in skin or flesh

inert: lacking the ability or strength to move

infrastructure: the basic structure a country needs in order to work properly

innovator: someone who introduces changes and new ideas

intake: an amount of food, air or another substance taken into the body

irrevocably: done in a way that cannot be changed

L

landfill: a site used to dispose of waste material by burying it and covering it over with soil

laureate: a person who is honoured with an award for outstanding creative or intellectual achievement

leach: to remove a substance from a larger object by water

leachate: water that has been leached out from a larger object

lethal: sufficient to cause death

M

malfunction: the failure of a device to work normally

mechanism: a system of parts working together in a machine

melt: to become a liquid by heating

metabolism: the chemical processes that occur within a living being in order to stay alive

meteorology: the scientific study of weather conditions

methane: a gas that you cannot see or smell, which can be burned to give heat

microgravity: very weak gravity, such as in a spacecraft

mine: a deep hole in the ground that people dig so they can remove coal, gold, etc.

molecules: the smallest unit into which any substance can be divided without losing its own chemical nature

multiply: to breed and replicate rapidly

municipal: relating to or belonging to the government of a town or city

myth: a traditional story that many people know or believe, but is not true

N

numb: unable to feel anything

O

obituary: a notice of a death that typically includes a brief biography of the dead person, often in a newspaper

opt out of: to choose not to participate in something

ore: rock or earth from which metal can be mined

oxygen: a gas that has no colour or smell, but is necessary for most plants or animals to live

P

palm: the inner side of your hand between your wrist and fingers

parallel: to be side by side with the same continuous distance, or to occur at the same time

paralyse: to make something lose the ability to move

parliament: the group of people who are elected to discuss and make a country's laws

patent: the sole right to make, use or sell an invention

pesticide: a substance used to destroy harmful insects and small animals

physiology: a science that studies the way in which the bodies of living things work

powdered: produced or sold in the form of a powder

prescription: the instructions for a medicine or treatment

prohibited: an action that is illegal or not allowed

prose: written language in its normal form, unlike poetry

pulp: a soft, wet, shapeless mass of material, often made from wood and used to make paper

purification: the removal of dirty or harmful substances

Q

quarry: a large, deep pit, where stone or sand are dug out of the ground

R

raw: natural; not changed by humans

residue: the small part of something that is left after the main part is used or moved

resin: a thick, sticky liquid that comes out of trees

resistance: the ability to stop something from harming you

resuscitation: reviving someone from unconsciousness

revolutionise: to completely change the way people do something or think about something

S

sanitary: relating to the conditions needed for an area to be healthy or hygienic

saturated: holding as much water or moisture as can be absorbed

scalpel: a knife with a small, sharp blade, used by a surgeon

scatter: throw in various random directions

sentiment: a general feeling or opinion

shuttle: a form of transportation that travels back and forth between two places

skull: the large bone that protects the brain

soaking: leaving in liquid for a time

spare: an extra item or amount, e.g. *spare key, spare time*

stabilise: to make something stable, so it is not likely to change or fail

steeply: an area or object that rises and falls sharply

sterile: completely clean and not containing any infectious bacteria

stimulant: a substance that encourages someone to be more alert and excited

subversive: weakening or destroying an established system or institution

surgery: medical treatment to repair or remove something inside the body

syntax: the arrangement of words and phrases in a language

T

thrive: to become very successful or very strong and healthy

tissue: a material of which animals and plants are made

tolerance: allowing people to do, say or believe what they want without criticising or punishing them

transaction: the act of buying and selling something

transceiver: a device that can both transmit and receive communications, often used in radio

transparent: an object you can see through

treadmill: a device used to exercise by walking and running, but without travelling

trickle: a very small flow of liquid

U

undergo: experience something unpleasant

urination: to get rid of the liquid waste from your body

V

vacuum: a space that is completely empty of all matter

vaporise: to change something into a mass of very small drops of liquid that float in the air

vent: an opening that allows air, gas or liquid to pass in and out of a space

W

warfare: the weapons and ideas used in war

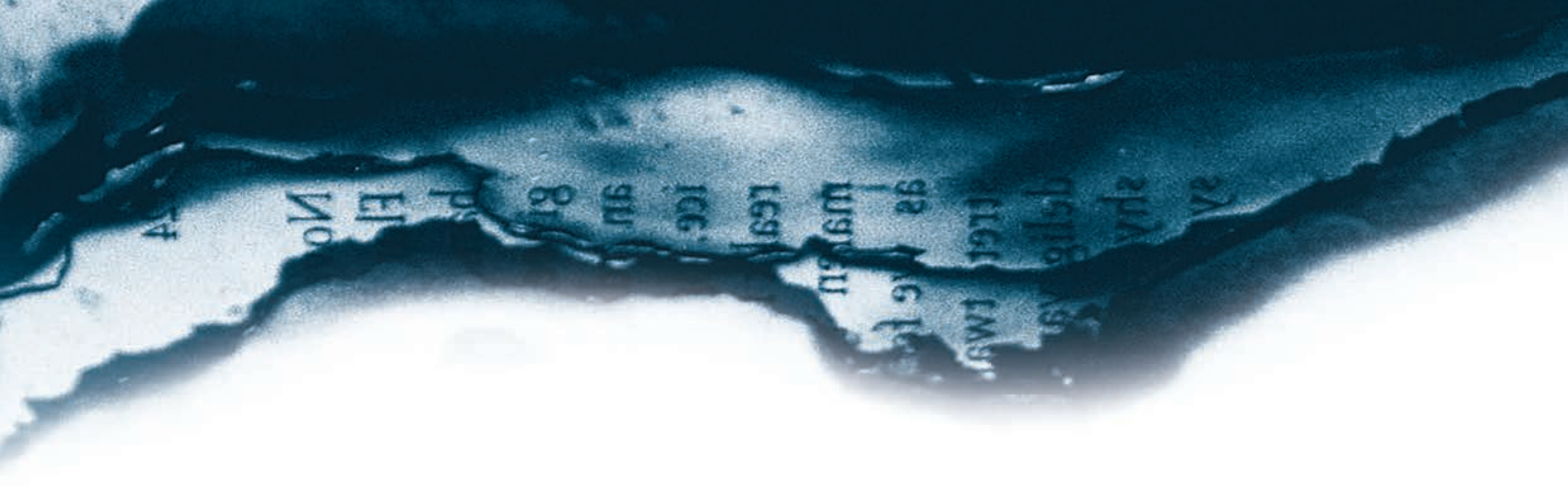
well: a deep hole in the ground from which people take water

wireless: a system that uses radio signals instead of wires, such as wireless Internet

wrinkle: a slight line or fold in something, especially fabric or skin

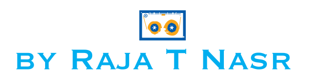


Great Scientists and Inventors



Contents

Short Stories Around the World



by Raja T Nasr

Stars in his Eyes

‘Stop looking at those stars and come and help me,’ Galileo’s father called.
‘Dreamer,’ said his teacher. ‘You’ll never have any success if you don’t study now.’
Galileo was a starry-eyed child. He often imagined himself flying through the clouds. He was sent away to school to become a doctor, but he did not learn easily. His favourite subject was mathematics. He believed that it could be a key to understanding the world around him.



At the age of eighteen, Galileo made his first discovery. He was in a church when he heard a strange noise. He noticed that an oil lamp was swinging backwards and forwards. He also heard the lamp’s chain hitting against the wall, and it seemed to him that they were both moving at the same time. ‘Am I only dreaming again?’ he wondered. But he hurried home to find out if what he thought was true.
He took two pieces of lead that were of the same weight and tied them to two short ropes of equal length. He fixed the ropes to a chair. He gave his father one rope to hold at the end with the weight; he held the other rope higher than his father’s. They let go of the weights at the same time and then counted the number of swings backwards and forwards. Both father and son reached one hundred together. ‘Father,’ shouted Galileo. ‘Don’t you see? My rope was further up than yours but they both arrived at the same point at the same time.’
The old Italian man could not know then that his son had just discovered a great fact. Nor did he know that, for hundreds of years, men would use his knowledge to measure time with a clock and to watch the stars and sun moving in the sky.



To Galileo, it was only the beginning. Next, he said that two different weights fall together if they come down from the same height. ‘Not possible!’ his friends said. ‘Everyone knows that a penny falls faster than a feather!’
‘Follow me and I will show you,’ commanded Galileo. And up to the top of the Tower of Pisa he climbed. He carried a ball in each hand, but one was ten times as heavy as the other. He let go of them at the same time and heard the crowd become silent when the balls hit the ground together. They had just seen something they could not believe!
For the rest of his life he worked to make things that the whole world still uses and enjoys today.
He made a compass that could always point North.
He used a magnet to explain many things about the Earth. He measured the temperature of the air with a thermometer.

Finally, he proved to the world that the Earth and the other planets in our solar system move around the sun, which is at the centre. To do this, he built a telescope through which he could study the stars, the sun and the moon.

From a boy who had science in his blood and stars in his eyes, he grew to be a great man who opened the beauties of the heavens to people on Earth.

Comprehension Questions

1. Draw a line between the words in Column A and the related word in Column B.

	A		B
1	thermometer	a	light
2	telescope	b	North
3	doctor	c	facts
4	lamp	d	temperature
5	discover	e	heavy
6	clouds	f	time
7	compass	g	patient
8	weight	h	sky
9	crowd	i	stars
10	clock	j	people

2. Answer the following questions:

1 Why was Galileo called a dreamer?
2 Why was he sent to school?
3 What did he think was the key to understanding the world?
4 How old was he when he made his first discovery?
5 Where was he when he made his first discovery?
6 What did the lamp and chain seem to do?
7 What did he tie the two ropes to when he was at home?
8 Who helped him with the ropes?
9 Who held the higher rope?
10 Was his discovery an important one? Why?
11 How do we use his discovery today?
12 What is the name of the tower that Galileo climbed?
13 Were the people surprised to see the balls fall together? Why?
14 What is a compass used for?
15 What is a telescope used for?

3. Tell the story in your own words.

4. Activity: Research some information about a famous scientist and share what you learn with the class.

Life that Kills

Today, we can protect ourselves against many illnesses that once meant death to thousands of people. This is because of the work of a famous French scientist who suffered much in his own life so that others might live.



Louis Pasteur was a bright boy, although his teachers said he was slow and always behind the rest of his class. The reason for this was simple: Louis was very careful in everything he did. He wanted to understand all that he studied and he asked many questions. 'Listen,' shouted an angry teacher one day. 'You're supposed to answer the questions, not ask them!'

But he never stopped asking questions. There was one special question he asked: What were illnesses caused by? In time, he discovered answers that have helped men to live longer ever since. He worked very hard to keep life going on, both in animals and people.

When the silkworms began dying and France's silk-makers were losing money, they turned to Pasteur for help. He found the trouble. Certain living germs, called bacteria, attacked the silkworm eggs. 'These same germs, or ones like them, can attack food, animals and even people,' he said. 'We must learn how to fight them. We must kill the germs without killing the animals or people.'



Pasteur found a way to kill the germs on silkworm eggs and the whole country was thankful. But during his years of work three of his own children died. Even in his sadness he believed that other children's lives could be saved if he could stop germs from spreading.

Next he helped farmers to fight germs that were killing their chickens. He also went one step further: he made the germs weak and fed the chickens with the weak germs. They did not become ill; their own bodies went to work against the germ. Then they were safe from any more attacks from the same germ. Thus began Pasteur's plan of vaccinations to stop illness.

It was a success with animals. 'But what about people?' Pasteur wondered.



While he was asking himself this question, he had a chance to answer it.
A woman brought him her son, who had been bitten by a mad dog. In those days, such a bite meant a slow and painful death. But the child's mother had heard of Pasteur's work with such dogs; he got the germs out from the dogs' mouths and used them to make a weaker form of the same germ. Pasteur put these weak germs into the boy's body fourteen times and he lived!
Doctors heard of Pasteur's work. They began to be more careful. They stopped putting people with different kinds of illnesses in the same room. Germs could be carried, they thought, from one person to the other. They also took more time to clean their hands, the beds and the rooms, to kill germs before they spread. After Pasteur's discoveries, there were fewer deaths.
He also studied different kinds of food and discovered new kinds of germs, so small they could only be seen by a microscope.
Pasteur's life was filled with work and the long wait for answers. Now, because his answers were right, the world is a healthier place to live in.

Comprehension Questions

1 Answer the following questions:

1 What was the name of the French scientist in the story?
2 Why did the teachers think he was slow?
3 Why were the silkworms dying in France?
4 What are some living germs called?
5 Did Pasteur help the farmers of France? How did he save the chickens?
6 What question did Pasteur ask himself next?
7 When did Pasteur try his plan on people?
8 What did he do to the boy?
9 Did doctors hear of Pasteur's work? Do you think they liked it? Why?
10 Was the number of deaths reduced after Pasteur's discoveries? Why?
11 Why did doctors put patients in separate rooms?
12 Are germs small? How can we see them?
13 Why is the world a healthier place to live in?

2 Find words in the story that have the opposite meaning to the following:

a) failure b) healthy c) same d) careless e) stronger

3 Write a paragraph about either vaccination or microscopes. If necessary, find information on the Internet or in science books. Illustrate your answer with a picture or a diagram.

4 In your own words, summarise Pasteur's contribution to medical science.

THE HIDDEN POWER

She was a poor girl who worked to get money to pay for her lessons. She became the most famous woman scientist of her time. That is the story of Marie Curie's life.

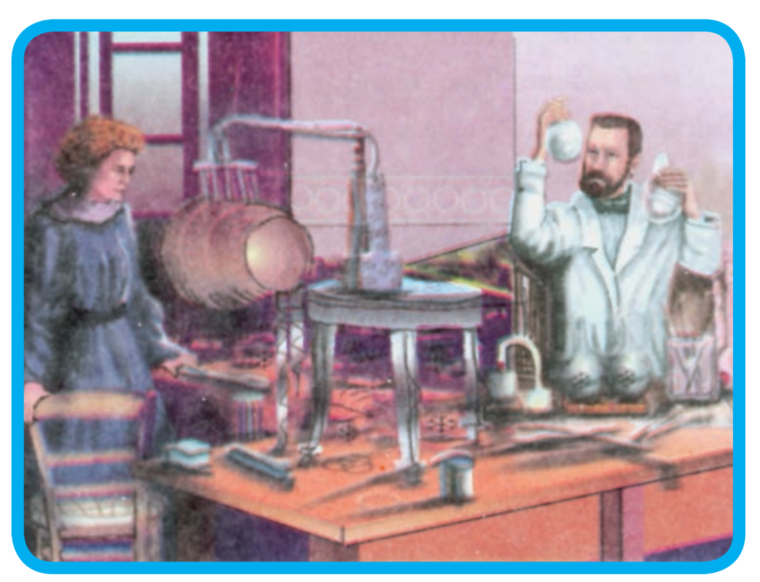
She did not mind working and she took little notice of the honours that were given to her in later years. This was the secret of her greatness.



She was born Marie Sklodovska in 1867. Marie lived in Poland where her father was a teacher. Everyone soon saw that Marie had a quick mind. When she was quite young, she loved nothing better than to spend hours reading books. But her body was thin and weak, so her mother often asked her to leave her lessons and play out in the sun.

Marie's mother died when her youngest daughter was only ten. From then on, Marie knew that she would have to work hard at her lessons if she wanted to be successful in her life. She studied very hard and won top honours at her school.

Marie and her older sister, Bronya, dreamed of studying in France at the Sorbonne. Their father, however, did not earn enough money to send them there. It was Marie who thought of a plan: she would teach at home and send money to Bronya. After her sister finished studying in Paris, she could get work and send Marie the money to study there herself.



With tears in their eyes the girls parted, and Marie worked very hard for six years to pay for her sister's studies. At last it was Marie's turn, but by the time she got to France, her sister was married and could not give her much help.

Again Marie worked. She studied in a small room without heat or light. She lived on bread and tea most of the time, but all she ever thought of was mathematics and science. This was her world, and above all, she liked her experiments. It was in Paris that she met and married Pierre Curie, a young scientist who had already earned respect.

Together they made their experiments in an old wooden house that was too cold and

damp for their health. They knew that some elements in the world gave off a strange power that could go through other objects. They found more of this power in some elements than in others, which made them believe that it must be a new element itself. For four years they tried experiments to separate this powerful new element. Then they found something which they called radium. Its power was very much greater than the power contained in other elements.

The Curies were given the Nobel Prize for their great discovery, but they were too ill to go to Stockholm themselves to receive it. They used the money for further experiments on the uses of radium. They found it could be used in treating diseases.

Pierre died suddenly just after he had been offered a good post at the Sorbonne. Marie Curie was given the post. She thus became the first woman ever to teach there. She continued their work and made many more important discoveries. In 1911 she received another Nobel Prize. It is the only time in history that two Nobel Prizes have been given to the same person.

Marie Curie discovered a hidden power and gave it to the world. It was this same power, however, that killed her in 1934.

Comprehension Questions

1. Answer the following questions:
   1. What was Marie's own family name?
   2. When was she born?
   3. What did she like to do most when she was a young girl?
   4. How old was Marie when her mother died?
   5. Who thought of the plan to send Bronya to Paris?
   6. Did the plan work in the end? Why not?
   7. In what conditions did Marie work in Paris?
   8. What was the name of Marie's husband?
   9. What did he do?
   10. What prize did Madame Curie and her husband receive?
   11. Why did they not go to receive it?
   12. When and how did Marie Curie die?

2. Copy and complete the table below. List the positive and negative experiences in Marie Curie's life.

Positive experiences	Negative experiences

3. Put these events in the correct order.

   a) Marie won her second Nobel Prize b) Marie's mother died c) Pierre died

   d) Marie went to France to study e) Bronya got married

4. What was unusual or exceptional about Marie Curie? Give examples.

A Sound in the Air

People laughed at Guglielmo Marconi all through his life because he had such big ears. But it is possible that he heard sounds through those ears which other people could not hear. And he worked all his life to send those sounds back through the air to a waiting, listening world.



Young Marconi had the best teachers to give him lessons at home in Italy. He loved books, especially those on science. He had a curious mind and always wanted to prove to himself what he read.

One day, when he was sitting by an open window, it seemed that a thousand noises filled his ears. 'Where are they all coming from?' he asked himself. 'And where will they go? What happens to all the words people say? Do they stay in the air round the Earth, just waiting for someone to pick them up?'

At once Marconi went to work. Sounds can be made to travel, he thought, if they are given a push by electricity. If I can push a piece of wood across the waves on water, I can also send sounds through the air waves by electrical power.

A few weeks later he called his mother and father up to his workroom for a surprise. He touched a little machine, and two floors below there was the sound of a buzz. 'How did you do it?' they asked. 'Your machine is so far from the sound.'

'That's right,' he said joyfully. 'I have just found a way to carry sound without wires – a wireless way.'

Although Marconi's father did not think the wireless sound would ever be important, he gave his son some money to continue his work. 'Father, with this money I am going to send messages round the world one day.'

He made a wireless machine and took it to England, where the public was ready to hear new ideas. 'What will those machines do?' they asked.

'I can send messages through the air,' he replied.

'Show us!' they said. And he did. On March 27, 1899, Marconi pressed the key on his wireless at a small village on the coast of France. After a few minutes of dead silence, a sound returned from across the channel at Dover, England: 'Your message was received. Very good.'

The British government helped Marconi to set up wireless stations all along the coast. He also put some of his machines on ships. One night during a bad storm at sea, two of the ships were in trouble and sent out calls for help. Marconi's wireless stations on the shore received the calls and sent help at once. All the men were saved.

Still this was not enough for the Italian scientist. He wanted to send his messages across the Atlantic Ocean, and he would not rest until this was done. He was sure that air waves follow the same line as water waves going round the Earth.



By 1901 he was ready to prove that he could do it. It was a thin, sick man who climbed to the top of a hill on the Newfoundland coast on the night of December 12. The sea was very stormy. He hoped that it would not stop him from hearing the message he expected to receive from England.

The time came. 'Now they are talking to me,' he said with his ear close to the receiving instrument. Half an hour passed. No sound. Another half an hour and then – a faint sound – one, two, three times! 'This must be it!' he cried. But he told no one. Instead, he waited for other messages sent during the next three days. All came through to him.

On December 15, 1901, Marconi told the world that he had heard messages by wireless from across the Atlantic Ocean. His great discovery led to many more wonderful things, like the radio, which we enjoy today.

Comprehension Questions

1. Answer the following questions:

   1 Why did people laugh at Marconi?
   2 Where was Marconi's home?
   3 How did he surprise his mother and father at home?
   4 How did his father help him?
   5 What did he tell his father that he would do?
   6 In what year did Marconi send his voice across the Channel?
   7 Who helped Marconi set up wireless stations?
   8 What happened to the men in the ships?
   9 What did Marconi do next?
   10 When did he do that?
   11 How was the sea that night?
   12 Why was his ear close to the receiving instrument?
   13 Why did he wait three more days to tell people about it?
   14 When did he tell people about it?
   15 Do you think Marconi gave us something important? Why?

2. Tell the story in your own words.

The Wizard of Menlo Park

A great fire burned before the curious eyes of a six-year-old boy. He enjoyed every minute of it, even though it was his father's store that burned to the ground. Later he said that he had started the fire himself. 'But why?' shouted his father.

'I just wanted to see what it would do,' came his son's reply.



This was the first of Thomas Alva Edison's experiments. It failed; so did hundreds more. But even when he failed, Edison learned something. 'I get results in everything I try,' he said once in later life. 'I've discovered several things that won't work!'

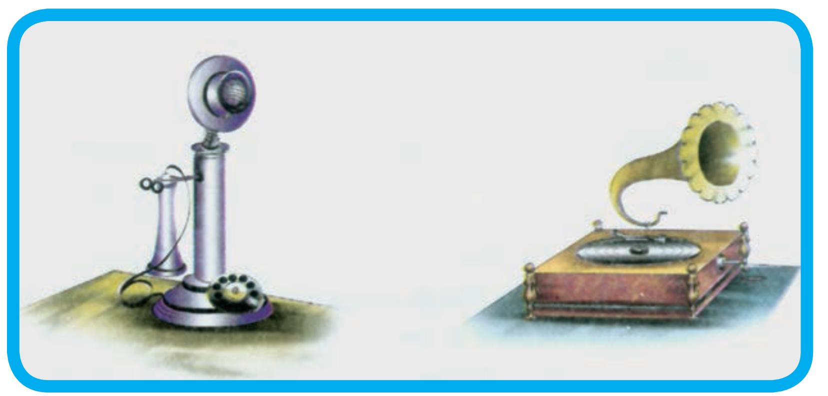
Tom Edison was born with a curious mind. It made him ask himself questions while he was still very young. He stayed in school for only three months because he was so different from the rest of the children there. Some said he was foolish. Others thought he was very clever.

His mother taught him at home and gave him many books to read. By the age of ten, it was clear that Tom wanted to be a scientist. He set up a laboratory at home and began his own experiments.

Few children even liked to play with Tom because he was so different. One afternoon he fed some powder to a friend, who later become ill. 'I'm sorry,' said young Tom, 'but I only wanted to see if it would form enough gas in his stomach to make him fly.' Another experiment had failed.

Edison's first job was selling newspapers on a train. He did not want to waste his time between stations, so he set up a moving laboratory on the train. Here he worked until one day a fire broke out and Tom was not allowed to work on the train any more.

Next, he set up his own telegraph station and sent out messages by using a train whistle.



At this point in his life, a rich man paid him forty thousand dollars for the right to make all the things he had invented. Joyfully, he took the money and set up a fine laboratory at Menlo Park, New Jersey.

There he worked to make such wonders as the gramophone, the cinema and a telephone

with both mouth and ear pieces.
The electric lamp is probably the most useful thing Edison invented. He knew that electricity produced power and heat. 'So why shouldn't it make light, too?' he asked himself. He looked for something that would burn for a long time without being used up. Then on the last day of the year 1879, he changed night into day by turning on several powerful street lamps outside his laboratory.
Edison worked hard and enjoyed his life, working for the pleasure and happiness of other people.
Once when his laboratory burned down and he lost everything, he said, 'I'll begin again. No one is ever too old to start working.'
He died in 1931 at the age of eighty-four.

Comprehension Questions

1 Answer the following questions:

1 Who burned down the store?
2 Why did he burn his father's store?
3 When did Thomas Edison start his experiments?
4 Why did he not stay at school?
5 Who taught him at home?
6 Where was his first laboratory?
7 What made his friend ill?
8 What was Edison's first work?
9 Why did he lose his work?
10 How much money did the rich man pay him?
11 When did Edison turn night into day?
12 What were some of the things he invented?
13 What did he say when his laboratory burned down?
14 When did Edison die?
15 How old was he when he died?

2 Copy and complete the table. List Edison's successful experiments and those that failed.

Successful experiments	Failed experiments

3 Put these events in the correct order.

a) Edison started a fire on a train.
b) Edison burned down his father's store.
c) A rich man paid Edison $40,000.
d) Edison set up a laboratory in Menlo Park.
e) Edison gave some powder to his friend.

4 List Edison's inventions that are mentioned in the story. Which one do you think is the most useful? Why?

5 Write a paragraph about Edison's personality. Comment on his attitude to danger.